

**Massachusetts Advanced Biofuels Task
Force
Public Hearing
Thursday, January 17th, 2008**

Written Comments

**To: Secretary Ian Bowles, Chair Advanced Biofuels Taskforce
Massachusetts Executive Office of Energy and Environmental Affairs
100 Cambridge Street
Suite 900
Boston, MA 02114
Att: Steven Clark
Email address: steven.clarke@state.ma.us
Telephone: (617) 626-1049**

Submitted By: Peter Bannigan

Massachusetts Advanced Biofuels Task Force
Public Hearing
Thursday, January 17th, 2008

The Commonwealth of Massachusetts, like many other states and the nation as a whole is embarking on a course of action whose principal aim is to meet the challenges of national security, reverse environmental damage caused by a petroleum based economy and maintain and/or improve the quality of life for the citizens of this country and state by substituting biofuels for petroleum based products. Achieving the above will require a dedicated stream of funding in the billions of dollars and impact virtually every citizen and sector in the nation and depending on the recommendations of this Taskforce the impact on the Commonwealth may be as significant or not. It is therefore critical to the success of the effort to establish a sound foundation on which to build a biofuels industry.

Success in establishing a biofuels industry within the Commonwealth will require recognition of and coordination with federal efforts, as articulated by the Energy Independence and Security Act of 2007. This act will be interpreted by the US Department of Energy and the US Department of Agriculture and is aimed at achieving a national goal of producing 36 billion gallons of biofuels, 21 billion gallons from advanced cellulosic biofuels, in the form of ethanol by the year 2022. The remaining 15 billion gallons are to come from a mix of other biofuels including biodiesel. The importance of recognizing the goals and objectives established at the federal level translates into the funding realities of supporting the Commonwealth's efforts through federal grants, appropriations, etc. The Commonwealth's ability supplement its own finances by garnering federal dollars for its efforts may ultimately result in successful implementations or, if lacking funds, missed opportunities.

Achieving the above national goals will require an estimated 1 billion tons of biomass on a dry weight basis derived from forest, agricultural and other waste resources which then have to be converted into ethanol by utilizing any number of to-be-determined manufacturing processes. Implicit in this statement are the underlying assumptions, regardless of whether it is to meet state or federal goals, that:

1. The correct / optimal mix of crops – residue – waste, etc. is readily available at a feasible market price.
2. An efficient collection and consolidation system is in place to gather the raw material for processing.
3. Efficient commercially proven processing plants are planned for and in place and operating at a capacity that is economical.
4. Market partnering arrangements are in place to integrate the biofuels into the existing petroleum system as required to meet the stated goals and objectives.

5. The distribution network for the biofuel(s) and/or biofuel(s)-petroleum mixture is in place.
6. Consumer outlets for the biofuel products are readily available and are acceptable to the buying public.
7. The price to the consumer is such that it is acceptable as a replacement product.
8. The product's performance characteristics are such that it is acceptable to the public.
9. The processes that are developed are sustainable technically, financially and environmentally.
10. The processes that are developed are environmentally friendly and are a demonstrable improvement over current petroleum based technology and meet established environmental standards.
11. Ensure that the biofuels technology and sector are integrated into and are compatible with other alternative energy technologies.
12. Regulatory authority is centered and focused such that it encourages research and development and its subsequent commercialization.

The traditional biomass inputs identified by the DOE & USDA in DOE's 2005 report, "Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply," provide an idea of the scale required to achieve the goals and objectives outlined in the 2007 act. The general category of inputs comes from:

Forest Resources:

Primary

- Logging residues from conventional harvest operations and residues from forest management and land clearing operations.
- Removal of excess biomass (fuel treatments) from timberlands and other forestlands.
- Fuelwood extracted from forestlands.

Secondary

- Primary wood processing mill residues.
- Secondary wood processing mill residues.
- Pulping liquors (black liquor).

Tertiary

- Urban wood residues – construction and demolition, tree trimmings, packaging wastes and consumer durables

Agricultural Resources:

Primary

- Crop residues from major crops – corn Stover, small grain straw and others.
- Grains (corn and soybean) used for ethanol, biodiesel and bioproducts.
- Perennial grasses.
- Perennial wood crops.

Secondary

- Animal manures.
- Food / feed processing residues.

Tertiary

- MSW and post-consumer residues and land fill gasses

Implicit in the above lists are the assumptions that the requisite research and development across a host of related fields, disciplines and agencies has been successfully completed and that the technology transfer has been successful. Additionally, it is assumed that the food/fuel competition, that has already begun, does not enter into the debate to such a degree that the production of biofuels is significantly curtailed.

Regardless of what course of action is taken by the Commonwealth, it is critical that disincentives to discourage, as best as can be arranged, the planting of traditional food crops for purposes of conversion to fuel be explored and adapted as required to insure an equitable balance. If this is not done the potential for serious discord arising from increasing food costs and even food shortages as a byproduct of unwarranted agricultural planting for the sack of fuel production will likely occur exacerbating the achievement of the ultimate goal.

The point of the above is to establish the need for careful planning and the creation of a funding stream that works for all parties. Failure to do the planning will only result in false starts or ambitious plans that can not be implemented. Ultimately the deciding factor in how broad and/or how aggressive the biofuels initiative is implemented for the Commonwealth will be determined by the amount of funding required to achieve it. It is clear that 100's of billions of dollars of both government and private sector fund will be needed over a 20 to 30 year time period to meet the national goals and that billions may be required to meet the Commonwealth's goals. The issue for the Commonwealth ultimately is how aggressive will it be in promoting the biofuels agenda and then who pays and when.

Just as the Taskforce should be cognizant of what is taking place nationally it must also recognize and work with all of its traditional regional partners. The states that make up the New England and/or Northeast region, depending on your outlook, are usually better off working cooperatively on issues like the environment and the economy than working alone and it is suspect that the same will be true for biofuels. The nature of the fuel business (gas, diesel, heating oil, etc.) is that it is regional based because of the need to tailor products to the various natural conditions imposed by weather and geography. The same will more than likely be true for biofuels as well.

The intent and purpose of the Advanced Biofuels Taskforce is to define what the outcome of establishing a biofuels industry really means and then to establish a framework that details the degree to which the Commonwealth should be invested in its effort to establish the industry within the confines of its geography. One overriding question that needs to be on the agenda and answered is, should Massachusetts be actively promoting a biofuels industry over and above what is taking place in the market place in general and at the federal level? Once this question has been answered the rest of the Taskforces business can continue.

Assuming that the answer to the above is yes, the Commonwealth should establish a biofuels industry, then the degree of commitment must be established by the Taskforce. The alternatives available to the Commonwealth and its leadership range from full blown direct investment to merely establishing a set of laws and regulations aimed at insuring a friendly well organized, regulated and honest market. Costs associated for these extremes range from the 10's of billions over 20 to 30 years to merely hundreds of thousand per year.

With commitment in place the task is to determine what incentives work best for creating and supporting the industry, how to best monitor / regulate that industry and in general foster its creation and growth within the to be established final goals and objectives. If the goal is to be a leader to some lesser degree the options are to create a friendly regulated environment with some incentives and hope that the private sector and the known academic research players, Harvard, MIT and, to a lesser extent, UMass - Amherst (the Land-Grant College) in conjunction with business or independently are able to develop the technology and infrastructure. The ultimate hope of course is that the businesses that emerge out of the R & D efforts will stay in the Commonwealth but history, even recent history, argues against it particularly in the area of biofuels.

If the intent of the Taskforce is to have the Commonwealth fully support the establishment of an Advanced Biofuels Industry there will be several key milestone to be met. In today's environment the need to establish a full blown industrial like biofuels will require a significant investment in resources to attract the intellectual assets key to driving the research and development component that will be the base of the industry. A harmonized regulatory approach with

uniformed goals and objectives that are clearly enumerated and that understand the needs of the biofuels industry will go a long way in establishing a critical mass of like businesses. A source of capital geared to supporting demonstration projects leading to full commercialization will be critical and may require pump priming by the Commonwealth. General consistent support by government, at all levels over time, will be required as well as to establishing an industry like biofuels because it will take generations to achieve.

The Taskforce should also recognize that Massachusetts is not the only state contending to establish a biofuels industry in which it will be a leader if not “The” leader in the industry. A good example of this competitive pressure can be seen just over the boarder in New York with the New York State Energy Research and Development Authority’s (NYSERDA) and the state’s land grant college Cornell University. Both Cornell and NYSERDA are actively engaged in attracting support for advanced biofuels research and they are supporting starting up biofuel and alternative energy operations. They both have funding and are willing to spend it. Can and will the Commonwealth match this type of investment?

Just as in the New York example, many much larger states with significant agricultural resources and infrastructures have been and are continuing to invest heavily in developing biofuels technology, to improve the efficiency of existing ethanol processing, developing new crop strains more suited to biofuels conversion, developing new processes for deriving fuels from biomass, etc. With this in mind it is important to recognize both the opportunity and the limitations imposed on the Commonwealth geography and climate and what is meant by the goal of establishing a biofuels industry.

It is not obvious what is meant by the directive to develop a Strategic Framework for the Commonwealth of Massachusetts that will “...promote the development of an advanced biofuels industry in the Commonwealth.” The reason for the ambiguity is the extremely large array of unknowns facing the Taskforce with regard to how best to position Massachusetts. Full blown support would require a significant commitment of Commonwealth finances in support of the agricultural and forestry industry through increased spending on in-field direct support as well as other infrastructure and logistics components of establishing an industry. Other associated expense leading to a full up commitment would be the funding of pilot and demonstration project required to keep companies in state. The list goes on and reliance solely on the venture capital industry and private enterprise, given the realities of national and regional efforts, is risky if the Commonwealth is serious about establishing this industry in state.

Given the above, it would be prudent for the Commonwealth to perform a complete SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis to fully understand the impact of the biofuels initiative and how the assets and liabilities of the various stakeholders within the state can or can not contribute to achieving the goal. Such an analysis would lay out the various sustainable

options open to the Leadership with associated costs and potential benefits. Once the pertinent information has been gathered, organized and presented reasonable informed decisions can be made as to exactly what it means to establish an advanced biofuels industry within the Commonwealth, what the role of the Commonwealth should be in that effort and if the Commonwealth's efforts and its associated goals are sustainable over the long haul.

One of the most significant assumptions regarding biofuels from cellulosic sources in general is that you are replacing petroleum products with ethanol or some other more bio friendly source. This is not always the case because the process, if not properly managed and set up, may only result in a shifting of the type of petroleum product used (i.e. shift away from gas but use more fertilizer) and when.

A good example of the above is the case of using crop residues as a primary source for biofuel input. Under normal practice the crop residue would be plowed back into the soil to enrich it to replace nutrients lost during normal growing thereby minimizing the need for fertilizer. If the residue is no longer plowed back how does the farmer replace the lost nutrients? The answer is fertilizer and what does that do to the petroleum energy saving expectations. A similar issue comes up when you talk about animal waste in dairy operations. Do you spread or send the manure to the plant? Do you figure out what the minimum soil nutrient requirement is and only send the leftover residue / manure for ethanol production? Who does the analysis on the farm and who pays for it? What are the environmental impacts and is plowing and harvesting traditional biofuel convertible crops really better in the long run?

The actual process of converting biomass to biofuels can be accomplished using a variety of methods ranging from anaerobic to aerobic processes, catalytic methods, etc., either alone or in conjunction with other processes. Depending on how you define biofuel inputs will determine what methodologies are selected and why. The significance of this can be seen when considering some of the catalytic options. Some catalytic processes such as Fischer-Tropsch and Sabatier as well as the Bosch Reaction can/could with additional research and development be used to economically transform not only biomass but post secondary consumer plastic waste into ethanol. The potential for cleaning up a significant environmental problem like plastic residue with its own massive input stream requires a rethinking of what the term biofuels can or should mean with respect to establishing a Biofuels Industry.

From a crop perspective what role can ocean derived residue play and what does it mean for the Commonwealth given that the sea and coastline are a significant aspect to life in Massachusetts. A recent estimate by Japanese authorities states that a 5 square mile kelp farm could produce up to 13 billion gallons of ethanol biofuel annually. With this in mind why just look at traditional farming methods and/or traditional crops like grains? Grains are one of the most

hotly debated biomass input issues today with respect to positive energy return from converting them into ethanol/bio-oil. Should the Commonwealth be looking to the sea, to more traditional based agriculture or is it better to use perennial grasses and wood crops?

The issue with grain crops is that they are both energy intensive and inflationary. In order to make a profit from corn, the most popular energy crop in the United States, you need to plant and grow enough corn per acre to justify the cost of planting. Typically for corn the average farmer needs to get about 200 bushels +/- per acre which requires the application of petroleum derived fertilizer. When the total energy inputs from field preparation to harvest and deliver to the plant are added up the result is either a net zero energy gain or, in some cases, a net negative in that it takes more petroleum based fuels to make a gallon of ethanol than what you get from the final product. If you ignore petroleum based products used in the field preparation and the fertilizer required to achieve the yield, which is what many proponents of ethanol today do, the energy gain from producing these crops looks good but is not a complete picture.

Because grain and soybeans are used in making so many food products ranging from sweeteners to cake mixes to even industrial product any change in the price of either has an immediate effect on the total cost of the other products. This in turn is reflected in the consumer price index food cost calculation as well as in the general inflation figures. Other products suitable for fuel use also have similar issues associated with them and argue for an analysis of just what is in the best interest of the Commonwealth and its residents.

Other considerations regarding crops, as mentioned earlier, are the food versus fuel debates. We already see the very real trade offs taking place throughout the world where the availability of some food and/or food related crops are in question because of the demand for fuel. Compounding this issue is the rising standard of living taking place in India, China, and to a lesser degree other places in the world. The combined pressure exerted by rising demand for more protein based foods coupled with the need to get away from petroleum based energy products is putting increasing demand on other food stocks such as dairy, oils, seafood, etc., resulting in price increases and additional environmental degradation.

The advantage of perennial grasses and wood products are that they require minimal if any field preparation or fertilizer and they can be grown on marginal land that today would normally not be considered for agricultural production. In a similar vein forest residue is normally considered when talking about biomass for biofuels. The issue surrounding forest residue is similar to that faced by shifting petroleum applications to fertilizers when harvesting crop residue.

Natural forests rely on the normal life cycle of growth, death and decay of tree and plant matter to supply nutrients to the soil to foster new growth. If forest

residue is to be harvested then this natural cycle will be interrupted either in the short term if managed or the long term with expected obvious effects. The question which must be answered is to what extent can this natural cycle be interrupted without having a deleterious effect on the well being of our forests. The importance of forests on the eco system and green house gases are obvious and important and therefore needs to be considered arguing for further analysis.

Given these trends the choices made by the Taskforce may have very serious consequences given its legislative leadership role nationally and, more directly with respect to consumers in the Commonwealth. There will be a need for establishing a balance such that the farmer's best interest is in agreement with the best interest of the consumer for both food and fuel. A failure to achieve a balance or near balance sets up the potential for crop and/or fuel shortages or pricing issues that could lead to significant direct political ramifications if establishing a biofuels industry is not carefully thought through.

Regardless of how invested the Commonwealth chooses to be with respect to biofuels there will need to be a significant shift if the role of the land grant institution, UMass - Amherst, and the Extension Service, its agricultural support arm. Additionally the Department of Agricultural Resources will also see a significantly impact because it will fall to them to first encourage the planting of biomass crops and then support and help develop orderly markets for the biomass farmers are producing.

Given the expected demands of a biomass industry, farmers will have a need for new crops strains to be developed, new more economical methods of farming, better means of collection, new economic models and the list goes on. Much of this would normally fall under the aegis of the state's land grant institution, UMass - Amherst. The significance of meeting the needs of the envisioned energy crop farmer will require more funds to support research and development for agronomy, agro-business, agricultural engineering, manufacturing process, etc.

A significant issue regarding alternative energy and how biofuels relates to other forms of power generation in general needs to be addressed. Do the demands of an Advanced Biofuels Industry warrant just increasing funds for the existing UMass - Amherst structure or is establishing a "Green University" that also incorporates other alternative technologies more appropriate? The answer to this and similar questions will determine the resources needed and the cost?

In a similar way the Department of Agricultural Resources may also need greater funding to carry out its mission to support farming in general. What will its mission be regarding the biomass and biofuels industry with respect to oversight and regulations and how will it interact with other agencies and departments. Alternatively, does the concept of Alternative Energy warrant its own department within the Secretariat? If so what resources are needed and at what cost?

In conclusion, the strategic framework and direction that is to be recommended by the Biofuels Task Force will set the Commonwealth on a course that at best will have a significant economic impact going well into the future and at worst will be costly and yield little or minimal benefit. In an effort to insure the best possible outcome given the large number of unknowns (available funding, processing methodologies, adequacy of local biomass inputs, undeveloped market, consumer acceptance, etc.) the prudent approach would be to fund and conduct a study. A traditional SWOT analysis with pro forma financial projections covering several scenarios as defined by the Taskforce would yield a better degree of understanding of just what the establishment of an Advanced Biofuels Industry means, how best to accomplish the goals and objectives set by the Taskforce and what can be afforded. The study should be focused and given a tight time line for completion.

In the intervening period between the time the study is undertaken and its conclusion much of the preliminary legislative work traditionally done prior to drafting legislation can be completed. Such activities as in-depth comment solicitation from interested parties and stakeholders, research into what other states are proposing or thinking about, a review of federal programs, potential integration of biofuels with other alternative energy programs and approaches and investigations into the feasibility of joint regional action can all be completed.

This written statement is submitted by:

Peter Bannigan
615 Franklin Street
Duxbury, MA 02332
1-339-932-1872
Pbann02332@hotmail.com

Mr. Bannigan moved to the Commonwealth with his wife from Albany, New York. In Albany Mr. Bannigan worked for the New York State Assembly as the Director of the Office of Management and Budget (OMB) and concurrently as Director of the Speaker's Regional Offices (SRO) covering a period of 11.5 years. In addition to his OMB and SRO responsibilities he provided legislative policy input on agriculture, alternative energy and technology transfer issues to Speakers Steingut and Fink. Speaker Fink appointed Mr. Bannigan to the Board of Directors of Cornell University as the Speaker's representative specifically in support of the land-grant colleges. After leaving the Assembly Mr. Bannigan worked as a consultant specializing in the Life Sciences, alternative energy, technology transfer, venture financing, energy conservation and other related fields.